University of Portland
School of Engineering

EE 262-δignals & δystems-3 cr. hrs.
Spring 2013

Midterm Exam # 2

(Prepared by Professor A. S. Inan)

(Friday, April 12, 2013)
(Closed Book Exam, 4 formula sheets allowed.)
(Total Time: 55 mins.)
(Any 7 of 10 problems in-class, other 3 take-home!)

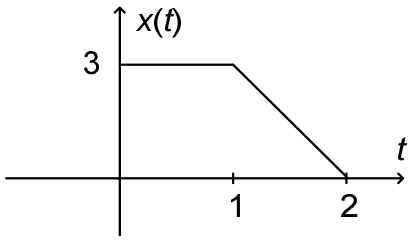
Name:_____ ☺

Signature:_____ ☺

(1) (10 points) **Unilateral Laplace transform.** Find the unilateral Laplace transform of the signal given by

$$x(t) = 12e^{-(t+1)}u(t-2)$$

(2) (10 points) **Unilateral Laplace transform.** Find the unilateral Laplace transform of the signal shown.



(3) (10 points) **Inverse Laplace transform.** Find the inverse Laplace transform of the signal given by

$$X(s) = \frac{6e^{-2(s-1)}}{s^3 + 2s^2}$$

(4) (10 points) **Inverse Laplace transform.** Find the inverse Laplace transform of the signal given by

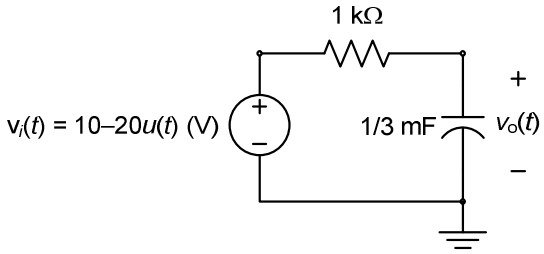
$$X(s)=\frac{3s^2-4}{s^2+2s+5}$$

(5) (10 points) **Unilateral Laplace transform.** Given $x(t)\leftrightarrow X(s)$ unilateral Laplace transform pair and given the signal $y(t)$ to be $y(t)=4e^{-2t}x(2t-4)$, express $Y(s)$ in terms of $X(s)$.

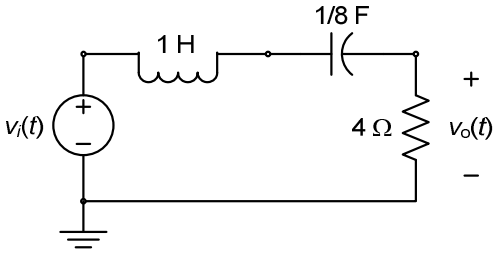
(6) (10 points) **Initial and final values.** Determine the initial and final values of $x(t)$ if the unilateral Laplace transform of $x(t)$ is given by

$$X(s)=\frac{3(s^2+4)e^{-(s-1)}}{s(s+2)^2}$$

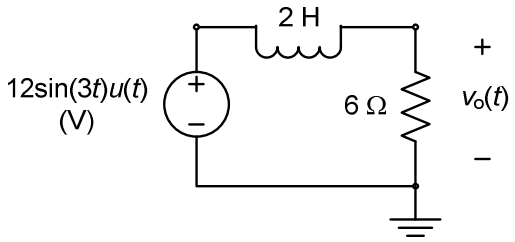
(7) (10 points) **Application of Laplace transform to electric circuits.** For the electric circuit shown, use Laplace transform to find the output voltage signal $v_o(t)$ for $t \geq 0$.



(8) (10 points) **Transfer function and impulse response.** Find the transfer function and the impulse response of the electric circuit shown.



(9) (10 points) **Application of Laplace transform to electric circuits.** For the electric circuit shown, use Laplace transform to find the output voltage signal $v_o(t)$ for $t \geq 0$.



(10) (10 points) **Applications of Laplace transform to solve differential equations.** Determine the response $y(t)$ for $t \geq 0$ of the differential equation with the specified input and initial conditions:

$$\frac{d^2y(t)}{dt^2} + 4\frac{dy(t)}{dt} + 3y(t) = \frac{dx(t)}{dt},\ x(t) = 2e^{-t}u(t),\ y(0^-) = 2,\ \left.\frac{dy(t)}{dt}\right|_{t=0^-} = 0$$